What is claimed is:

1. A 1,4-di-substituted diacetylene polymer that is soluble in an organic solvent, composed of a repeating unit represented by the general formula =CR-C≡C-CR'= (wherein R and R' represent identical or different monovalent organic substituents), and has an average degree of polymerization of 4 to 200 and a ratio (Mw/Mn) of weight average molecular weight (Mw) to number average molecular weight corresponding to said average degree of polymerization (Mn) of 1.1 to 5.0.

2. The 1,4-di-substituted diacetylene polymer according to claim 1, wherein the organic substituents R and R' are selected from any of:

$(CH_2)_mOCONHCH_2COOC_nH_{2n+1}$ (wherein m represents an integer within the range of 3 to 6, and n represents an integer within the range of 1 to 10),

$(CH_2)_mCONHCH_2COOC_nH_{2n+1}$ (wherein m represents an integer within the range of 3 to 6, and n represents an integer within the range of 1 to 10),

$(CH_2)_mOSO_2C_6H_4CH_3$ (wherein m represents an integer within the range of 3 to 6), and

$(CH_2)_mOCONHCH_2CONHC_nH_{2n+1}$ (wherein m represents an integer within the range of 3 to 6, and n represents an integer within the range of 1 to 10).

3. A process for producing the 1,4-di-substituted diacetylene polymer according to claim 1 comprising: irradiating a solution of soluble 1,4-di-substituted diacetylene polymer with laser light having a wavelength within the range of 250 to 1,200 nm, and preferably 550 to 900 nm, to cause a photodegradation reaction of said polymer.

4. A process for producing a 1,4-di-substituted diacetylene polymer according to claim 4, wherein the irradiation time is from 10 seconds to 180 minutes.

5. A process for producing the 1,4-di-substituted diacetylene polymer according to claim 1 comprising: heating a solution of soluble 1,4-di-substituted diacetylene polymer to a temperature of 100 to 300°C to cause thermal degradation of said polymer.

6. A process for producing a 1,4-di-substituted diacetylene polymer according to claim 5, wherein the heating time is from 30 minutes to 5 hours.

7. A composite composition in which the 1,4-di-substituted diacetylene polymer according to claim 1 is compatible with a transparent sheet.

8. The composite composition according to claim 7, wherein the transparent sheet is selected from an aromatic vinyl resin, acrylic resin, polyester, polycarbonate, polyurethane, polyamide, polysulfone, polycyclopentadiene, photosetting resin and thermosetting resin.

9. A composite composition with an inorganic polymer obtained by reacting the 1,4-di-substituted diacetylene polymer according to claim 1 in a polycondensation reaction with a metal alkoxide represented by alkoxysilane.

10. An optical part obtained by using a film, sheet or three-dimensional molding based on the compositions according to claims 7 and 9.

11. An optical part obtained by using the composite compositions according to claim 5 and 7 as a surface layer.

12. The optical parts according to claims 10 and 11, wherein the composite compositions according to claims 7 and 9 are used in transparent sheets, microspherical resonators and optical waveguides.